REMARKS

In view of the foregoing amendments and the following remarks, Applicants respectfully request reexamination of the present application. Claims 92, 97 and 107 have been amended, Claims 103-106 and 111 have been cancelled and new Claims 222-224 have been added.

Applicants note with appreciation that the Examiner has objected to Claims 97, 104, 111 and 116 as being dependent upon a rejected base claim, but states that these claims would be allowable if rewritten in independent for including all of the limitations of the base claim and any intervening claims. Applicants have amended independent Claim 92 to incorporate the limitation of Claim 104 and Claim 104 has been cancelled. Applicants have amended independent Claim 107 to incorporate the limitation of Claim 111, and Claim 11 has been cancelled. Further, Applicants have added new Claims 222-224. Independent Claim 222 is substantially dependent Claim 116, re-written in independent form.

Claim Rejections – 35 U.S.C. § 102

The Examiner has rejected Claims 107, 109, 110, 115 and 118 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 4,072,771 to Grier, Sr.. The Examiner states that Grier discloses a copper conductor paste comprising a mixture of an oxidized copper powder having particle size of 1-10 μm, glass frit comprising about 1-10 wt.% of the solid mixture and 15-25% volatile decomposable fluid suspension vehicle. The Examiner further states that the glass frit reads on the limitation binder phase and the volatile decomposition fluid suspension vehicle, which comprises 30$ of poly-n-butyl methacrylate in 70% butyl carbitol acetate reads on the limitation organic vehicle phase. The Examiner also states that the oxidized copper powder having copper oxide on its surface reads on applicants' composite particle, which contains metal phase of copper and non-metallic phase of copper oxide.

The Examiner has also rejected Claims 107, 109 and 118 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 5,981,069 by Tani et al. The Examiner states that

Tani et al. discloses copper paste containing a mixture of copper powder coated with copper phosphate having a diameter of about 0.2 μm to 1.0 μm and glass frit dispersed in organic vehicle.

Applicants have amended independent Claim 107, upon which Claims 109, 110, 115 and 118 depend, to incorporate the limitation of Claim 111. Therefore, removal of this rejection is requested.

Claim Rejections Under 35 U.S.C. § 103

The Examiner has rejected Claims 92-96, 98-103, 105, 107 and 117 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,420,744 by Asada et al. in view of U.S. Patent No. 5,588,983 by Tani et al. The Examiner states that Asada et al. discloses a spherical, single-crystal metallic powder of 1 μm or smaller in particle size, wherein the powder is of at least one member selected from Pd, Ag, Ni and Cu. The Examiner also states that Asada et al. also teaches a conductive paste where the spherical single-crystal metal powder is made into a paste by dispersing powder in vehicle comprising ethyl cellulose and milling. The Examiner notes that single-crystal has crystallite size very close to particle size. Thus the single-crystal metallic powder taught by Asada et al. would have crystallite size of 1 μm or less, which reads on the claimed crystallite size. The Examiner further states that the difference between the claim and that in Asada et al. is that Asada et al. do not teach a binder phase.

The Examiner points out that it is well known in the art to form conductive paste by combining copper powder with glass frit and dispersed in organic vehicle, and that Tani et al. teach combining 80 parts by weight of copper, 7 parts by weight by glass frit and 13 parts of organic vehicle to form conductive paste.

The Examiner also points out that it would have been obvious to one skilled in the art at the time the invention was made to combine in the proportion taught by Tani et al., the spherical single-crystal metallic powder taught by Asada with glass frit as it is well known in the art, to form conductive paste absence unexpected result.

With regard to Claim 93-94, the Examiner states that Tani et al. taught the copper used to form copper paste must be free of oxidation and uniform in particle size, where as noted in Table 1 the copper powder contains at least 90 weight percent of the particles less than twice the average particle size. The Examiner points out that it would have been obvious to one skilled in the art at the time the invention was made to use copper powder taught by Asada et al. having uniform particle size as disclosed by Tani.

The Examiner states that with regard to Claims 103 and 105, Tani et al. disclose coating the copper powder with stearic acid to form a thin film or a protective coating on the entire surface of each particle. The Examiner points out that it would have been obvious to one of ordinary skill in the art at the time the invention was made to coat the copper powder of Asada with stearic acid to protect the copper powder from oxidation.

Applicants have amended independent Claim 92 to incorporate the limitation of Claim 104. Claims 103 and 105 have been cancelled. Claims 93-96 and 98-102 depend upon Claim 92 an include all of the limitations thereof. Applicants have amended independent Claim 107, upon which Claim 117 depends, to incorporate the limitation of Claim 111. Therefore, removal of this rejection is requested.

The Examiner has rejected Claim 106 under 35 U.S.C. 103(a) as being unpatentable over Asada et al. and Tani et al, and further in view of Grier, Sr.. The Examiner states that the difference between the claim and that of Asada et al. and Tani et al. is that the primary references do not teach coating the metal with a metal oxide.

Applicants have cancelled Claim 106, therefore removal of this rejection is requested.

The Examiner has rejected Claims 107, 109, 110, 112, 113, 114, 115 and 118 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,600,604 by Siuta in view of Grier, Sr.. The Examiner states that Siuta discloses a metal oxide-coated copper powder, suitable for conductors in multiplayer, having average particle size of 1-5 μm, where the metal oxide is an oxide of metal selected from Si, Ti, Ce, Zr, Al, Ba, Li, Sr, La, Mg, Ca, V, Ta and mixtures thereof. The Examiner also states that the metal oxide-coated copper powder taught reads on the limitation "composite particle" having metal phase of copper and non-metallic phase. Siuta also teaches a printable thick film paste comprising the

above metal oxide-coated copper particles in organic medium. The Examiner further states that the difference between Siuta and the claims is that Siuta does not teach a paste containing a binder paste.

The Examiner states that Siuta teaches that it is known by the Grier patent to form conductor composition comprising Cu particles, which have been preoxidized to form a surface layer of CuO, glass frit dispersed in organic medium. The Examiner also states that in the Grier patent the glass frit is taught to have resistance to chemical change under reducing environments in the firing oven and when combined with metal oxide forms an excellent bond with the ceramic or alumina substrate.

The Examiner points out that it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine glass frit disclosed by Grier with the metal oxide-coated copper powder taught by Siuta to have better bonding with ceramic or alumina substrate.

Independent Claim 107 has been amended to incorporate the limitation of Claim 111. Claims 109, 110, 112-115 and 118 depend upon Claim 107 and include all of the limitations thereof. Therefore, removal of this rejection is requested.

The Examiner has rejected Claim 108 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,981,069 by Tani et al (now Tani 1) in view of U.S. Patent No. 5,588,983 by Tani et al. (now Tani 2). The Examiner states that Tani 1 teaches the claimed thick film paste except Tani 1 does not teach the particle size distribution of copper metal particles. The Examiner also states that Tani 2 teaches to form thick film paste the copper powder is required to be free from oxidation and uniform in particle size and that in Table 1, the copper powder disclosed contains at least 90 weight percent of the particles less that twice the average particle size. The Examiner points out that it would have been obvious to one skilled in the art at the time the invention was made to use powder taught by Tani 1 having uniform particle size as disclosed by Tani 2 to form thick film paste.

Claim 108 depends upon Claim 107, which has been amended to incorporate the limitation of Claim 111. Therefore, removal of this rejection is requested.

Applicants believe that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecute and or expedite allowance, the Examiner is invited to contact the undersigned.

Respectfully submitted,

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